

SECURITY INFORMATION  
CENTRAL INTELLIGENCE AGENCY

REPORT

## INFORMATION REPORT

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SUBJECT Order of Lenin and Order of Labor  
Red Banner Dynamo Works imeni Kirov  
at Moscow

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Identification

1. The Moscow Order of Lenin and Order of Labor Red Banner Dynamo Works imeni Kirov (Moskovski Ordena Lenina i Ordena Trudovogo Arushnogo Znamenii Zavod Dinamo imeni Kirova) is located at no. 17 Leninskaya Sloboda, proletarski raion, Moscow.
2. The railway branch line of the works enters the yard of the works and some of the shops. It runs from the Tovarnaya (freight) Station of the Moscow-Ryazan railway. The next station after Tovarnaya is the Gorodskaya Bolnya (Town Slaughterhouse).
3. Streetcars [ ] and buses [ ] connect the works with the town. Bus [ ] runs to the settlement of Kosnakhovo, where many workmen and employees of the ZIS Works and Dynamo Works live. This line started running in 1949. In addition to the streetcar and bus lines, there is also the Metro (Zavod imeni Stalina - ZIS Station).
4. All articles produced by the works bear the letters DK (Dinamo Kirova).

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History and Production (1897 - 1945)

5. The works was established in 1897 by a [ ] joint stock company and produced small electric motors and diverse electrical equipment. Later the works was acquired by the [ ] Company.
6. After the revolution the works was nationalized, and for the first few years after the civil war output was greatly reduced. In 1921 the works began to work more normally and produced small transformers and certain electrical equipment for streetcar lines and executed repairs of electrical machinery. At that time 820 workers were employed.
7. In 1924 the works started large-scale serial production of electrical motors exclusively for streetcars of the D series (DM-1a, DB-2, etc). The motors had single-cast casings (tehnokorpusny) with oscillating bearings (podsushnaya kacheniya).

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8. In 1928 and 1929 the works produced nearly all the electric equipment required for the electrification of Moscow suburban railways (Moscow - Lytishchi line). The Lytishchi Rail Car Works built the cars.
9. In 1930 the works completely mastered the production of all electrical equipment for electric railroad cars of the 3D series and of complex group electro-pneumatic controllers such as MKG-162 for suburban electric railways. They also produced DP-150 electric motors for railcars in series.
10. Reconstruction and expansion of the works began in 1930. Large buildings for the works and auxiliary services were erected. The area occupied by the works was extended several times over. New equipment was installed. The works became the Giant Works. Some of the shops cover a very large area. For example, the shop in which at the present time the Second Machine Shop is installed is 480m long. The old building of the former works now accommodates the 1st Tool Shop. The foundry is one of the largest in the whole of the USSR. The reconstruction of the works was completed at the end of 1931, and the factory was given the task of producing all the electric equipment (traction motors, crane motors, and equipment) for electric and thermoelectric rolling stock and hoisting machinery of all kinds.
11. In 1931 the Dynamo Works and the Engineering Works imeni Kuibyshev at Kolonna (55-05N, 38-45E) started joint production of main-line internal combustion locomotives (teplovoz). Trials on the Ashkhabad Railway were successful, and in 1932 a whole section of the Ashkhabad Railway was converted to internal combustion electric traction (teplo-elektricheskaya tyaga). Dynamo produced all the electrical equipment.
12. At the end of 1932 the Dynamo Works and the Kolonna Works produced the first main-line six-axle electric locomotives of the ES-11 series, with 3,000 volts, 2,040 kw, and recuperative braking. The speed was 30.5km per hour.
13. In 1933 the Dynamo Works and the ZIS Works, with the aid of the Yaroslavl Automobile Works, produced the first Soviet trolley buses of the LK type.
14. In 1933 the All-Union Electrical Association (VVO - Vsesoyuznoye Elektricheskoye Obedineniye), in view of the importance of the work of the Dynamo Works, decided to reinforce its staff of specialists and designers, disbanded the Elektrotyagstroi (Electric Traction Construction Trust), an organization of the VVO, and embodied the main part of the organization in the Dynamo Works. The Elektrotyagstroi organization had been in existence since 1925 and was engaged in planning and assembling work for the electrification of transport of all kinds, including electric locomotives, internal combustion locomotives with electric drive, and electric rail cars. The organization carried out several complicated tasks such as the electrification of the Baku-Sabunchi railway in the Azerbaijan SSR and of the Suram Pass section of the Transcaucasian Railway in the Georgian SSR.
15. In 1934 the Dynamo Works together with the Kolonna Works produced the PB-21 (letters denote in the name of the Politburo) high-speed (skorostnoi) electric locomotive with the following characteristics: 3,000 volts, 2,040 kw. The designed speed is 140km per hour, and there are three DSE-680 twin (dvoyenny) motors.
16. In 1935 the Dynamo Works began to build in series DTK-60 motors with multiple series (posledovatelno-parallelny) excitation.
17. In 1936 the Dynamo and Kolonna Works started producing VL-19 (Vladimir-Lenin-19) main-line electric locomotives with two voltages, 1,500 and 1,300 volts.

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18. In 1937 the Dynamo and Kolonna Works produced the powerful SO industrial electric locomotive with the following characteristics: weight on drivers (stsepoi ves) - 92 tons, 880 kw.
19. In 1938 the Dynamo Works together with the Podolsk (55-23N, 37-30E) Engineering Works imeni Ordzhonikidze produced surface and mining contact and battery electric locomotives of several types.
20. In 1938 and 1939 the Dynamo and Kolonna Works produced six-axle freight and passenger electric locomotives with recuperative braking of the SK-01, SK-04, and SKU-05 series (SK denotes Sergei Kirov). Together with the Podolsk Works Dynamo produced new Liliut mine electric locomotives, weight on drivers 3.5 tons, 6.8 kw; and seven-ton 2 TR-2 mine electric locomotives.
21. In 1939 the Dynamo and Kolonna Works produced OR-22 electric locomotives, weight on drivers 132 tons, 2,040 kw dc motors with smooth regulation by means of mercury rectifiers (delivered by the Leningrad elektrosila works).
22. In 1939 the Dynamo and Yaroslavl Works produced trolley buses of a new type, the YaTB-3 double-decker and the YaTB-4 improved single-decker. The traction motors were of the DTK-60 type, 60kw, multiple-series excitation, recuperative rheostat braking.
23. A great work was accomplished by the Dynamo Works over a period of several years before the war in designing and mastering the production of electrical equipment for locks and other hydrotechnical constructions. For inventing a system of automatic control of floodgates of hydrotechnical junctions of the Volgostroi, the following engineers of the Dynamo Works were awarded Stalin Prizes and the title of Laureate: D. L. Varshavski, who died recently; M. M. Sinaiski, who became Chief Engineer of the works; M. I. Kustanovich, promoted and now employed in the Ministry of Electrical Industry; and E. A. Leibovich.
24. In the years before the war the Dynamo Works also produced crane electric motors of several types and electric motors for the metallurgical industry.
25. In 1941 a large part of the works was evacuated, but in 1942 after the retreat of the Germans from Moscow a large part of the evacuated works returned to its former site in Moscow. At that time the director of the works was Ivan Timofeyevich Skidanenko, former director of the Kharkov Electric Machinery Works (KhEMZ), and the Secretary of the Party organization was Nikolai Alekseyevich Orlovski, who replaced Skidanenko as director in 1945.
26. In the first year of the war the works produced only for defense: for the People's Commissariat for Tank Industry, the People's Commissariat for Armaments, and the People's Commissariat for Munitions, but remained under the control of the People's Commissariat for Electrical Industry.
27. From the end of 1942 part of the works again started producing peacetime electrical equipment in view of the great need of the coal and metallurgical industries. There was a great demand for electric locomotives for the mines in order to increase the output of coal and ores, and the works was given an urgent order to organize in full the production of electric locomotives. An electric locomotive shop was organized, and the works began to produce in full the type 2 TR-2 electric locomotive for which in 1938 they had produced only the equipment. These locomotives were sent to the Kuznetsk Coal Basin and, after liberation, to the Moscow and Donetz coal basins.
28. At the beginning of 1945 the works had already produced more than a thousand of these electric locomotives and several thousand sets of electrical equip-

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ment for these and for electric locomotives of another type produced at other works. During the war the works also produced crane electric motors of several types, electrical equipment of prewar type, a small quantity of motors, and electrical equipment for electric power stations.

#### Production (1945-1950)

29. Before the war the Dynamo Works was the sole producer of electrical equipment for electric transport of all kinds. The great development of electric and thermoelectric transport anticipated for the years following the war necessitated the expansion of the production base of this industry. According to the postwar Five-Year Plan which has now been put into effect, it was specified that new factories should be built and existing ones adapted for the production of electric rolling stock and equipment.

#### Main-line Electric Locomotives

30. At Novocherkassk (47-24N, 40-06E), Rostov Oblast, the Electric Locomotive Works imeni Budenny of the Ministry of Electrical Industry was built to produce complete VL-22 main-line electric locomotives.
31. The Dynamo Works produced at the end of 1946 the VL-22 main-line electric locomotive, which is a modified VL-19 produced before the war. This modified version passed all tests on the South Ural railway and on the Moscow section (Podmoskovski Uchastok). After this, certain alterations were introduced, and later the Novocherkassk Works was given the task of mastering the serial production of these locomotives and producing 550 of them in the postwar Five-Year Plan. Not only the engineering part had to be mastered but also the whole of the electrical equipment of the locomotive.
32. The Dynamo Works assisted the Novocherkassk Works with personnel, including several specialists, and handed over all working drawings and part of the machine tool equipment. During the first three years of the postwar Five-Year Plan the Dynamo Works continued to send traction motors and part of the electrical equipment to the Novocherkassk Works, but at the present time the latter has already mastered the complete production.

#### Electric Railroad Car Sections (Sektsiya)

33. The production of electric railroad car sections, electric rail cars, and trailers for the electrification of suburban railways and complete electric equipment for these cars was entrusted to the following works at Riga: to the Riga Rail Car Works the production of the cars and the installation of electrical equipment and to the Riga Electric Engineering Works (REZ) the production of traction electric motors and all other electrical equipment. The Dynamo Works also helped these works with their experience. By the third year of the postwar Five-Year Plan the Dynamo Works had almost completely ceased to deliver traction motors and electrical equipment, production having been mastered by the REZ Works.

#### Internal Combustion Locomotives (Teplovoz) with Electric Drive (Privod)

34. Before the war internal combustion locomotives were produced by the Kolosna Engineering Works imeni Kuibyshev and the Dynamo Works. From 1946, the beginning of the Five-Year Plan, production was entrusted to Kharkov Factory No. 75 (KhZTM - Kharkovski Zavod Transportnogo Masinostroyeniya) of the Ministry of Transport Machinery. Electric traction motors and part of the electrical equipment are being and will continue to be delivered by the Dynamo Works.

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Generators for the locomotives and part of the equipment are being and will continue to be produced at the Kharkov Electric Machinery Works imeni Stalin (KhEMZ).

#### Traction Electric Motors for Industrial and Mine Electric Locomotives

35. Production of traction electric motors and electrical equipment for industrial and mine electric locomotives has been partly entrusted to the Prokopyevsk Electric Machinery Works No. 651 at Prokopyevsk (53-50N, 86049E), Kemerovo Oblast. The Dynamo Works will continue to produce electric motors for industrial and mine electric locomotives. The production of the mechanical part of mine electric locomotives has been entrusted to various coal machinery works. Powerful industrial electric locomotives are also built by the Kharkov Factory No 75, which also produces internal combustion locomotives with electric drive.

#### Present (1951) Production

36. Present production is as follows:

- a. Serial production of traction electric motors and electrical equipment for urban transport, including underground railway cars, streetcars, and trolley and motor buses. The works is also producing electrical equipment for escalators for the Moscow Metro.
- b. Serial production of crane and metallurgical electric motors for hoisting and conveying equipment and for excavators, including motors for swing, traveling, gantry, and tower cranes, etc; for excavators of the Ural-Heavy Machinery Works (Uralmashzavod) with three-ton scoop and for super-power traveling (Shagayushchi) excavators. Lifting electromagnets for electric traveling cranes, all electric equipment for cranes, and electrical equipment for automatic loaders (Avtopogruzhchik) for factory transport.
- c. Traction motors and all electrical equipment for mine and industrial electric locomotives of several types including new condenser locomotives.
- d. Electric motors and equipment for new hydrotechnical constructions, including those at Kuibyshev, Stalingrad, and the Volga-Don Canal, and electric motors with special damp-proof insulation. In 1951 the Dynamo Works is to produce all the electrical equipment for 15 locks of the Volga-Don Canal (30 panels, 15 central control panels; in all more than 60,000 instruments and apparatuses).
- e. The works has individual orders for electric motors and equipment for various industries, including many orders for drilling equipment for the oil industry and several orders for electric equipment for electric power stations.
- f. Electrical consumer goods. The works produces a great quantity of electric hotplates (elektroplitka or kamfarka), about 10,000 per month; DTK step-down transformers which supply, for example, a current of 12 volts from the town electric lighting system for operating children's toys with small electric motors, and for lighting Christmas trees. Other small articles.

#### Personnel

37. Approximately 7,500 workers are employed at the works. In most of the shops

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three shifts are worked, day and evening shifts of eight hours and a night shift of seven hours.

38. Chief personnel is as follows:

- a. Director: Nikolai Ivanovich Krestov (since January 1951), formerly director of Factory No. 717 of the Ministry of Electrical Industry at Khotkovo, Moscow Oblast, which produces electrical insulating materials. He was awarded Stalin Prize 3rd Class for supervision of work on a new treatment of laminated electrical insulating materials. Prior to Krestov, the director of the Dynamo works was Nikolai Alekseyevich Orlovski (1945 to 1951),

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- b. Secretary of Party Organization of works: Aleksandr Vasilievich Anisimov, who retained his post. He is the Senior Engineer, Laureate of Stalin Prize 3rd Class for participation in inventing a method of smelting high-quality pig iron with oxygen blast.
- c. Chief Engineer: Mikhail Mikhailovich Sinaiski, Stalin Prize Laureate for designing automatic electrical equipment for the Volgostroi. Prior to him the Chief Engineer was D. S. Chernichkin, now Deputy Minister of Electrical Industry.
- d. Production Chief: Boris Isaakovich Kats, whose deputy is Andrei Vasilievich Kashtarov.
- e. Chief Mechanical Engineer (Mekhanik): Grigori Alekseyevich Kolchev.
- f. Chief Power Engineer: Mikhail Gregoriyevich Yurev.
- g. Acting Chief Designer: Aleksei Petrovich Ivanov. In 1946 the Chief Designer was Lev Yakovlevich Lehtman, who was replaced in 1947 by Chief Designer Aron Abramovich Rabinovich

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- h. The following engineer-designers are employed in the Design Office:

L. Aizenshtein	G. Ilyukhin	K. Patrikeyev
N. Batalov	A. Ioffe	B. Tikhmenev (Stalin Prize)
K. Brazhnikov	A. Kolonkov	S. Tikhomirov
I. Belkin	I. Kudryavtsev	A. Trufanov
N. Yermakov	V. Lauren	K. Trukhin
		Ya. Vitenberg
		S. Yarovoi

Installations

Design Office

39. The works has an experienced design office which works together with MEI imeni

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Molotova (Moskovski Energeticheski Institut - Moscow Power Institute) on the creation of various electrical devices and electric motors of new types for production not only at the Dynamo Works but also at other factories of the Ministry of Electrical Industry. For example, in 1950 the design office with the assistance of MEI designed a new improved streetcar with automatic starting and braking control and with motors entirely on springs (polnostyu obressorennny dvigatel). This car will be produced at the Riga Rail Car Works and the Riga Electrical Engineering Works. In 1950 the design office also designed for the Riga Works a new improved electric rail car section for suburban traffic. Production will start in the middle of 1951.

40. In 1948 the design office designed and the Dynamo Works mastered the production of a series of new standardized electric motors for urban transport of all kinds. The new motors rest on springs (obressorennny); they have hinged drive (Sharnirny Privod) and maximum specific gravity of 7.8kg per kw of hourly capacity, approximately twice as low as that of ordinary traction machines. The standardization of all motors for urban transport of all types facilitates and accelerates their production to a considerable extent.
41. In 1948 and 1949 the design office designed and the Dynamo Works started the production of a new standardized series of crane and metallurgical electric dc and ac motors.
42. In 1949 the design office designed a series of industrial electric locomotives of 12 types, to meet the basic requirements of undertakings of the coal, mining, and other branches of industry. These locomotives are now being produced at various factories of the coal and mining industries.
43. In 1949 MEI and the design office designed condenser electric locomotives of new types for mines for which a large number of the participants received Stalin Prizes.
44. Factory shops are as follows:
  - a. 1st Machine Shop
  - b. 2nd Machine Shop
  - c. 3rd Machine Shop
  - d. 1st Instrument (Apparatny) Shop
  - e. 2nd Instrument (Apparatny) Shop
  - f. 3rd Instrument (Apparatny) Shop
  - g. 4th Instrument (Apparatny) Shop
  - h. 5th Instrument (Apparatny) Shop
  - i. Winding and Insulation Shop
  - j. Armature (Yakorny) Shop
  - k. Solid (Tverdy) Insulation Shop
  - l. Experimental Designs Shop
  - m. 1st Mechanical Preparation (Mekhanano-Zagotovitelny) Shop
  - n. 2nd Mechanical Preparation (Mekhanano-Zagotovitelny) Shop
  - o. 1st Tool Shop
  - p. 2nd Tool Shop
  - q. Stamping (Shtampovochny) Shop
  - r. Hot Pressing Shop
  - s. Forge
  - t. Foundry with sections for iron casting, steel casting (electric furnaces), and non-ferrous casting. Capacity: up to 2,500 different parts per month.
  - u. Electroplating (Galvanicheskii) Shop
  - v. Drawing and Thermic (Volochnilno-Termicheski) Shop
  - w. Fastening (Krepezhny) Shop

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- x. Consumer Goods Shop
- y. Railway Shop
- z. Electric Repair Shop
- aa. Shop of Chief Mechanical Engineer's Section

45. During the period of the postwar Five-Year Plan there was frequent reorganization of the shops in connection with changes of production. For example, after the complete production of electric locomotives had ceased, the electric locomotive shop was closed. The shops for crane ac and dc motors and the 1st and 2nd Traction Shops were also reorganized.

#### Earning Capacity of Works

46. In 1946, the first year of the postwar Five-Year Plan, the works had a deficit of about eight million rubles. The State granted a subsidy to cover the deficit in full. In 1947 the State subsidy was seven million rubles, but the works began to show a profit and refused the subsidy. Profits were about four million rubles. In 1948, 1949, and 1950 the works showed a large profit.

#### Destination of Postwar Products

47. A partial listing of the destinations of Dynamo products follows:

- a. Electric motors and electrical equipment have been sent to many ferrous and non-ferrous metallurgical works and to important heavy engineering works, for the restoration of factories destroyed during the war and for the installation of new machinery. Production has been sent to the following works:

Stalingrad Krasny Oktyabr Works  
 Krivoi Rog Metallurgical Works  
 Stalin Metallurgical Works at Stalino  
 Yenakiyev Metallurgical Works  
 Makeyevka Metallurgical Works (electric equipment for blooming mills)  
 Kuznetsk Metallurgical Combine  
 Zaporozhstal (Zaporozhe Steel Trust)  
 Azovstal (Azov Steel Trust)  
 Taganrog Metallurgical Works imeni Andreyev  
 Dneprodzerzhinsk Metallurgical Works  
 Magnitogorsk Metallurgical Combine  
 Amurstal (Amur Steel Trust)  
 Novokramatorsk imeni Stalin Works (at Elektrostal and Kramatorsk)  
 Chirchik Lead Works  
 Leninogorsk Polymetallurgical Combine  
 Norilsk Nickel Combine, and many others

- b. Production has been sent to the following electric power stations:

For restoration of DneproGES the works delivered electrical equipment during the period 1946 to 1950, including central control panels.  
 Alapuyevsk GES  
 Ivanovo GES  
 Yaroslavl GES  
 Parkhad GES

- c. Equipment for locks was sent to the Volga-Don Stroi this year and to other hydrotechnical constructions.

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- d. Motors and electrical equipment for urban transport for the towns of: Moscow, Leningrad, Kharkov, Odessa, Rostov-on-Don, Minsk, Kiev, Vladivostok, Voronezh, Krasnodar, Tbilisi, Yerevan, Baku, Tula, Komsomolsk-on-Amur, Khabarovsk, Shakhty in Rostov Oblast, Chelyabinsk, and Sverdlovsk.
- e. Electric rail car electrical sections for suburban traffic for the following railways:
  - Moscow - Domodedovo (3 km)
  - Moscow - Aleksandrovsk (113 km)
  - Podolsk - Grivno (8km)
  - Setun - Odintsovo (10km)
  - Moscow - Mytishchi
  - Mytishchi - Monino
  - Moscow - Reutovo - Balashikha
  - Tbilisi - Borzhomi
  - Kiev - Boyarka
- f. Mine electric locomotives and their motors and electrical equipment for mines of Donbas, Moscow Basin, Sakhalin, Kuznets Basin, etc.
- g. Crane electric motors and equipment for factories, ports, ships of various fleets, and for excavators produced by Uralmashzavod (with scoop of 3 cubic meters) and for very large traveling excavators.
- h. Electric motors for internal combustion locomotives with electric drive for Transport Machinery Works No. 75 at Kharkov.
- i. Electric motors and equipment for electric locomotives for the Budenny Works at Novocherkassk.

Postwar Output

48. [redacted] the whole output of the works. [redacted] may be expressed in the following figures:

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- a. Mine and industrial electric locomotives built entirely by Dynamo in 1946, 1947, and part of 1948: about 1,300. Weight on drivers of majority of mine locomotives: 7 tons.
- b. Dc and Ac Crane Motors (including motors for excavators):
  - 1946 - about 2,600
  - 1947 - about 5,400
  - 1948 - about 8,000
  - 1949 - start of production of new series of dc motors (in middle of 1949), ac motors (beginning of 1949), and of standardized motors ...about 9,000 (sizes 1 to 5).
  - 1950 - production of motors of new series of sizes 1 to 8 (with detachable bodies) about 13,000 (likewise all crane electric equipment)
- c. Electric Motors for Mines and Industrial Electric Locomotives and All Electric Equipment for Electric Locomotives:
  - 1946 - about 1,700 motors
  - 1947 - about 2,000 motors
  - 1948 - about 2,400 motors

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1949 - about 2,700 motors  
 1950 - about 3,100 motors

d. Electric Motors for Urban Transport (Metro, streetcars, trolley and motor buses):

1946 - about 1,600  
 1947 - about 2,100  
 1948 - about 2,300  
 1949 - about 2,600  
 1950 - about 3,000

From 1949 all motors were of new standardized series.

e. Electric Rail Car Sections for Suburban Railways: The term section denotes a train unit composed of one electric railcar and two trailers with control.

1946 - 6  
 1947 - 12  
 1948 - 10  
 1949 - orders for separate equipment only, as the Riga ReZ Works started complete production at that time.  
 1950 - 2 sections of a new system for the electric equipment of suburban trains (produced together with Riga Rail Car Works).

f. Electric Motors and Equipment of Main-Line Internal Combustion Locomotives with Electric Drive: From 50 to 100 sets are delivered annually to the Kharkov Transport Machinery Works.

g. Electric Motors and Equipment for Main-Line Electric Locomotives: In 1946, 1947, and 1948 about 150 sets were delivered to the Budenny Works at Novochoerkassk.

h. Electric Spares for Electric Power Stations:

Value of output in 1946: 500,000 rubles  
 Value of output in 1947: 1,500,000 rubles  
 Value of output in 1948: 2,000,000 rubles approximately  
 Value of output in 1949: 2,000,000 rubles approximately  
 Value of output in 1950: 2,500,000 rubles approximately

i. Lifting Electric Magnets for Cranes:

Several hundred produced during the Five-Year Plan.

j. Electric Automatic Loaders:

Several hundred produced during the Five-Year Plan.

k. Dynamos for Train Lighting:

A large number produced. [REDACTED]

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l. Electric Equipment for Locks and Hydropneumatic Constructions;

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## m. Consumers Goods:

1946..... about 50,000 electric hotplates  
 1950..... about 80,000 electric hotplates

## n. Electric Equipment for Escalators and Elevators:

Several individual orders for the town of Moscow have been filled.

I Technical Information on the Production of the Dynamo WorksElectric Equipment for Electric Rail Cars of Suburban Railways

749. Electric equipment for electric rail cars of suburban railways was produced by Dynamo Works in 1945-1947 and is now produced by Riga RZ Works, as previously mentioned. Serial production of electric equipment for electric rail car rolling stock started in 1946.

a. Traction Motors: Before the war the works produced traction motors of types DP-150, DPI-150, and DPI-152 for electric rail cars of SD series, designed for 1,650 volts. A large number of electric rail cars of this series are working at the present time with these motors. After the war the works produced a small number of DPI-152 motors. The production of DP-150 and DPI-150 motors has completely stopped, and the works accept orders only for the repair of these motors.

- 1) Brief Characteristics of DPI-152: each car is fitted with four motors, coupled in two motor groups, each of two motors, in series connection. Hourly performance (chasovoi rezhim) at 750 volts, 250 amp, 865 rpm, capacity on axle (OS) 165 kw. Continuous performance at 750v, 185 amp, 970 rpm, 122.5kw. Weight of motor: 2,580 kg. All of these motors are series motors, each with four main poles and four auxiliary poles, with two brush holders and a cooling ventilator installed on the armature shaft.
- 2) After the war the works began to produce motors of two voltages, 1,650v and 3,300v for electric rail cars. Production of motors for two voltages was due to the advisability of switching over electrified suburban railway sections to a single system of electric traction of 3,300v dc for main-line and suburban railway transport. In the transitional period, until the switch-over of all electrified suburban sections to 3,300v, the works is producing motors of two voltages.
- 3) Electric rail cars equipped with motors for two voltages are designated motor cars of SR series. In the design of the mechanical part, pneumatic and braking equipment, the SR cars differ little from the SD car. In 1947 the Riga Rail Car Works began to build these electric rail cars in a large series. All the electric equipment for these cars is supplied to Riga by the Dynamo Works.
- 4) The Dynamo Works produces traction motors of two types for these cars, DK-103 and DK-103 A. These motors are designed for a voltage of 1,650v on the commutator (kollektor) (until now the official works' documents rate the nominal power as 1,500v) and with series connection of two motors their insulation permits switching to a voltage of 3,000v (3,300v).
- 5) The number of motors in the car is four. The motors are coupled in two motor groups of two motors in each, and when working the groups can be connected in series or in parallel, and the motors in each group can likewise be connected in series or in parallel. These combinations en-

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sure equal voltage on the commutator of each motor and consequently equal speed of the train on railway sections with voltage of 3,000v and with voltage of 1,500v (1,650v).

- 6) Characteristics of DK-103 A Motor: Hourly performance with voltage of 1,500v on the commutator, 132 amp, 1,100 rpm, capacity 180 kw. Continuous performance with 1,500v, 95 amp, 980 rpm, capacity 128 kw. Weight of motor: 2,550kg.
  - 7) The DK-103 and DK-103 A motors are series motors with four main and four auxiliary poles and four brush holders and are self-ventilating. They have a one-piece steel body, not detachable, and are octagonal in shape for the convenience of mounting.
- o. Auxiliary Electric Machines for Electric Rail Cars of SR Series are produced as follows: DK-405 B Generators for feeding low voltage circuits. In working order they also recharge storage batteries. In idle state the source for feeding low voltage circuits is the storage battery. The armature of the generator is mounted on the shaft of a DK-601 A dynamotor. Characteristics of DK-405B control generator: Quadripolar machine with shunt excitation, capacity 4.5kw, 90 amp, 1,350 rpm.
- DK-601 B Dynamotors serve as motors for the control generator (generator upravleniya) and on railway sections with 3,000v serve also as voltage separators for feeding the motor compressor operating at 1,500v (1,650v). Continuous capacity 5.5kw, 3 amp, 1,350 rpm.
- DK-406 A-B 400 Motor Compressors feed with compressed air the braking and electric pneumatic systems of the train. Capacity in hourly performance: 6.2kw, 5 amp, 1,500v, 1,050 rpm.
- c. DMG 1 500/50 motor generator for the SD series of electric rail cars. The generator is structurally united with its electric motor and EK 15/2-B 400 motor compressor.
  - d. Current collectors of two types for the collection of current from the current-carrying system:
    - DZh-4 pantographs for cars of the SD series (production ceased from 1948).
    - DZh-5K pantographs for cars of SR series.

Pantographs (current collectors of pantographtype) consist of a frame construction, a component part of which is a four-sided hinged mechanism with a pneumatic system. The DZh-5K is of lighter construction than the DZh-4 and is devised to attain train speeds of 150km per hour. Weight of DZh-5K: 350kg; of DZh-4: 550kg.
  - e. Low voltage control equipment produced by the works for electric rail cars:
    - KV-6 B driver's controller for control of working of power circuit of traction motors by means of corresponding change-overs in the control circuit. The controller has a main and reversing lever. Weight of controller: 30kg.
    - VU-7 A switch (vyklyuchatel) for control circuit for connecting the control circuit and the low voltage auxiliary circuit to the source of power. Weight of switch: 2kg.
    - RUM-7 A cut-out switch (razedinitel) (sic) for control circuits. Weight of cut-out switch: 7kg.

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Push-Button (knopochny) switches: five-button KU 7 1-4 in the control cabin of each electric rail car; weight of switch: 5kg. Twelve-button KU 9A-1 in control cabin of electric rail car; weight of switch: 24kg. Nine-button KU 10 A-1 in control cabin of trailer. Other types: KU 25 A-1, KU 25 A-2, KU 16 A-1.

Electro-magnetic valves (ventil) for remote control of intake and discharge of compressed air of the electro-pneumatic equipment. VV engaging valves: VKV disengaging valves.

KLP 52 V-1 Pantograph valves (Klapan pantografa) to control the raising and lowering of the pantograph. Weight of valve: 11kg.

GLP-1650 main safety fuse (predokhranitel) for SD electric rail car. Two per car. Weight of fuse: 11 kg.

YaP 22 A-1 main safety fuse for SR electric rail car. Two per car. Weight of fuse: 86kg.

RK main cut-out switch for SD electric rail car. One per car. Weight: 16kg.

GV-2-A main cut-out switch for SR electric rail car. 1 per car. Weight: 62kg.

LK 551 D line contactors for SD rail car, 1 per car. Weight: 190kg.

LK 300V-1 line contactors for SR rail car, 1 per car. Weight: 270kg.

PKG 1 62R-1 group controller for SD rail car, 1 per car. Weight: 540kg.

PKG 3 20A-2 rheostat controller for SR rail car, 1 per car. Weight: 210kg.

PSh 245-16A throw-over switch (pereklyuchatel) for reduction of field (oslableniye polya) for SD rail car, 1 per car. Weight: 150kg.

Yak 22A-1 bridge contactors and contactors for shunting of field for SR rail car, 1 per car. Weight: 210kg.

OM 20A-1 switch-off device (otklyuchatel) for traction motors for SR rail car, 1 per car. Weight: 120kg.

Yak18 A-1 auxiliary contactors for SD rail car, 1 per car. Weight: 95kg.

Yak 23A-1 auxiliary contactors for SR rail car, 1 per car. Weight: 228kg.

ISH 2A-1 induction shunt for SR rail car, 2 per car. Weight of one: 268kg.

SZh-2B starting resistances (puskovoye soprotivleniye) for SD rail car, 12 per car. Weight of one: 700kg.

KF 16A-1 starting resistances for SR car, 8 per car. Weight of one: 392kg.

KF 15A-1 resistance for shunting of field for SR rail cars, 1 per car. Weight: 38kg.

KF 14A-1 general damper resistance (obshcheye dampfernoye soprotivleniye) for auxiliary circuits for SR rail car, 1 per car. Weight: 34kg.

YaS 11A-1 damper resistance for auxiliary engines for SD rail car, 2 per car. Weight of one: 20kg.

YaS 28B-2 damper resistance for auxiliary engines for SR rail car, 1 per

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car. Weight: 60kg.

RN 165B -1 zero relay for SD rail car, 1 per car. Weight: 30kg.

PR 23A-1 panel with relay for SR rail car, 1 per car. Weight: 32kg.

YaR-2A box with maximum relay for SD rail car, 2 per cars. Weight of one: 30kg.

YaR-8B box with relay for SR rail car, 1 per car. Weight: 107kg.

YaP-46A-1 box with safety fuse for SD rail car, 1 per car. Weight: 76kg.

YaP-47A box with safety fuse for SR rail car, 1 per car. Weight: 68kg.

RShch22A-1 switchboard for SD rail car, 1 per car. Weight: 30kg.

RShch22B-1 switchboard for SR rail car, 1 per car. Weight: 30kg.

YaK 19A box of auxiliary contactors for SD rail car, 1 per trailer. Weight: 45kg.

YaK 23B-1 box of auxiliary contactors for SR rail car, 1 per trailer. Weight: 180kg.

SV 1A connectors for traction motors of SD rail car.

Smaller equipment of several other types.

#### Electric Equipment for Electric Rail Cars of the Metro

50. The Mytishchi Rail Car Works (Moscow Oblast) produces Metropolitan electric rail cars of three types for the Metro: old type B and new types G and D (1950). The Dynamo Works produces all the electric equipment for these cars as follows:

a. For B cars: DMP-151 traction motors, four per car. The motors are coupled in two groups of two motors in parallel in each. The groups have two connections, in series and in parallel. Hourly capacity: 153kw, 750v. Hourly current: 225 amp, 784 rpm. Weight of motor: 2,400kg. Auxiliary engine - EK-7,5/1-E-400 motor compressor. The works produces all electric equipment for the cars.

b. For new G cars: DK-102 traction motors. Hourly capacity: 83kw, 750v. Hourly current: 248 amp, 1,160 rpm. Weight of motor: 1,500kg (without transmission - pereach). EK-7,5/1 E-400 motor compressor.

c. Electric equipment for G cars: KV-9V driver's controller. TR-IV rail current collector. GV-10 G main cut-out switch. YaP-13 I main safety fuse. LK-753 B box with three line contactors. KF-6A-2 starting and braking resistance. PKG-754A group rheostat controller which includes:

RK rheostat controller. RU acceleration relay (rele uskoreniya).

RT braking relay. RV time relay (rele vremeni). RB by-pass relay.

PKG-755A group intermediate throw-over switch (perekhodny pereklyuchatel).

PKG-753A group throw-over switch, comprising reverser and TP brake throw-over switch.

RZ-3 plug socket (rozetka) for inter-car connection.

ShU-3 plug for inter-car connection.

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RUM-11A cut-out switch for control circuits.

VU-7V switch for control circuit.

Yar-7B box with relay comprising: RP overload (peregruzka) relay and RN zero relay.

Button switch reset (reset). KU button switch. RTA rheostat for automatic braking.

#### Electric Equipment for Trolley Buses

51. The works produces electric equipment for trolley buses which were first produced by works No. 82 of the Ministry of Aviation Industry at Tushino and later by the Moscow Trolley Bus Repair works. Types of trolley buses are the MTB-82 and MTRZ.

##### a. Traction Motors for Trolley Buses:

DTB-60. Hourly capacity: 60kw. 350v. Hourly current: 124 amp. 1,270 rpm. Weight without transmissions: 655kg.

DK-201 compound motor. Hourly capacity: 74kw. 550v. Hourly current: 150 amp. 1,270 rpm. Weight without transmissions: 625kg.

DK-202 compound motor. Hourly capacity: 80kw. 550v. Hourly current: 160 amp. Continuous current: 130 amp. 1,300 rpm. Weight without transmissions: 675kg.

##### b. Equipment for Trolley Buses:

DK-652 motor compressors. RT-6D current collectors. IK-3B-3 (or IK-4B-3) radio-reactors. TP-18A panel comprising: KPD-22 power contactors and KPD-24 shunt contactors.

TP-19A panel comprising: KPD-3 line contactors, RM-3001 maximum current relay, R-3100 maximum voltage relay, R-3100 zero relay, R-3151 stop signal relay, TS auxiliary resistances.

AV-1B-2 automatic switch. KF-2 starting resistance.

KVP-8A control controller comprising: KV control controller and TK brake controller and reverser.

Yas-20B-7 shunt resistance. AK-5A-2 pressure regulator.

VU-3A-3 control switch. RShch-38 switchboard.

#### Electric Equipment for Street Cars

52. The works produces DTI-60 motors with trolley suspension and DK-254 motors with independent suspension and reducing gear (reduktor). The works also produces all electric equipment for streetcars.

a. DTI-60 Motor. Hourly capacity: 55kw. 550v. Hourly current: 112 amp. Continuous current: 70 amp. 825 rpm. Weight of motor with gear transmission: 1,160kg; without transmission: 965kg.

b. DK-254 Motor. Hourly capacity: 50kw. 600v. Hourly current: 95 amp. Continuous current: 72 amp. 1,600 rpm. Weight without transmission: 525kg.

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- c. DK-254A Motor. Almost the same characteristics as the preceding one; delivered only to Ust-Katav Works for KM-1 two-axled streetcars.
- d. DK-251 Motor (Old Type). Hourly capacity: 45kw. 550v. Hourly current 184 amp. Continuous current: 130 amp. 805 rpm. Weight without transmission: 965kg.
- e. DK-255 Motor. Hourly capacity: 54kw. For MTV-82 (Works No. 82 of Ministry of Aviation Industry) four-axled streetcars. Four motors per car.

Electric Equipment For Motor Buses

53. The works produces electric equipment and motors with electric transmission for ZIS-154 buses built by the ZIS Works as follows:

- a. DK-305: hourly capacity: 43kw. 190v. Hourly current: 260 amp. Continuous current: 210 amp. 1,000 rpm. Weight without transmission: 463kg.
- b. DK-505: hourly capacity: 50kw. 190v. Hourly current: 265 amp. Continuous current: 215 amp. 1,700 rpm. Weight without transmission: 420 kg.

D/T no 807184

Industrial Electric Locomotives

54. Until 1948 DKM-12 electric haulage locomotives were produced in their entirety by the Dynamo Works. Characteristics are as follows:

standard body. Weight on drivers (stepnoi ves). Weight of locomotives on driving wheel pairs: 28 tons. With full ballast: 35 tons. Two-axled with rigid frame and with individual drive to each axle from individual traction motor. Maximum speed: 25km per hr. Two DPE-100 traction motors. Total capacity: 140kw. Tractive effort: 3,650kg. Width of gauge: 1,000mm. Two G-300 compressors (290 liters pm; 8 atm). The G-300 compressor is supplied by the Yaroslavl Brake Works. Motor for this compressor, made by Dynamo; 2.5kw. 550v.

55. In 1949 the design office of the Dynamo Works designed a series of industrial electric locomotives for the coal, mining, and other branches of industry. The first models of some of the new locomotives were produced in their entirety at the works, and after trials and rectifications production was handed over to other works. The Dynamo Works still produces the traction motors and all the electric equipment. These new locomotives are of the following types:

- a. I-KP-3A: The first model was entirely produced by Dynamo at the end of 1949. This locomotive is intended mainly for internal factory transport but can be used for shunting work at coal and mining enterprises. Weight on drivers: 14 tons. Two-axled. Two DPE-64A traction motors. 120kw. Voltage of network: 600v. Maximum speed: 40km per hr. Tractive effort: 2,350kg. Width of gauge: 750mm. Braking: pneumatic and electric.
- b. I-KP-4A: Model built at Dynamo. Same characteristics as I-KP-3A except that width of gauge is 1,000mm.
- c. II-KP-2A: Contact type with standard body (there are electric locomotives with reduced /Ponizhenny/ bodies. Weight on drivers: 30 tons; with ballast: 35 tons. Width of gauge: 750mm. Voltage of network: 600v. Four-axled, with pivoted bogies (povorotnaya teleshka), not connected to each other. Individual drive to each axle from traction motors: Four DPE-100 traction motors. Hourly capacity: 260kw. Tractive effort: 4,880kg. Maximum speed: 50 km per hr.
- d. II-KP-3A: Similar characteristics to II-KP-2A, but width of gauge is 1,000mm.

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- e. II-KP-1A: Similar characteristics, but width of gauge is 1,524mm.
  - f. III-KP-1A: For internal factory transport for haulage operations of small undertakings. Weight on drivers: 30 tons; with ballast: 35 tons. Voltage of network: 825v. Width of gauge: 1,524mm. Two-axled with rigid frame and individual drive to each axle from individual traction motor. Two DK-8A traction motors. 432kw. Tractive effort: 6,650kg. Maximum speed: 60km per hour.
  - g. III-KP-2A: For internal factory transport. Weight on drivers: 28 tons; with ballast: 30 tons. 600v. Width of gauge: 1,524mm. Two-axled, as preceding type. Two DPE-100A traction motors. Tractive effort: 4,500kg. Maximum speed: 60km per hr.
  - h. IV-KP-1A: Haulage electric locomotive for operations at open workings of coal, mining, and other branches of industry. Weight on drivers: 73 tons; with ballast: 80 tons. 1,650v. Width of gauge: 1,524mm. Four-axled on two inter-connected bogies. Four DK-8A traction motors; 864kw. Tractive effort: 13,300kg. Maximum speed: 70km per hr. DK-405-A control generators.
  - i. IV-KP-2A: Similar characteristics to IV-KP-1A, but voltage of network is 825v. Haulage electric locomotive for operations at open workings of coal, mining, and other industries.
  - j. V-KP-2: This is a modified and modernized SO electric locomotive. The SO was built in 1938 by Dynamo. It is a powerful locomotive and is used at open workings of large mining undertakings. Built in series at other works Dynamo supplies traction motors and all electric equipment. Weight on drivers: 82 tons; with full ballast: 94 tons. Length: 13,500mm. Width: 3,300mm. Maximum speed: 60 km per hr. Four-axled on two interconnected bogies. Four DPE-220 traction motors. 994kw. Tractive effort: 18,600kg. Two B-500 compressors with DK-404-B or DK-402-V motor. The compressors are produced at the Yaroslavl Brake Works; 1,750 liters pm, 8atm. Compressors and motors are mounted on a common baseplate. Two motor ventilators of centrifugal type for cooling traction motors and rheostats. Each ventilator cools two traction motors and eight rheostat boxes. Motors for ventilators: DV-18/750 and new DK-403-V. DU-3A and DU-3G control generators for feeding control and lighting circuits. KB-4/360 motor for the cable drum. Suspension of contact conductor on some working sections is difficult. In such cases there is a reserve of cable on the drum through which current is supplied. There is an electric motor for automatic unwinding and rewinding of cable.
56. Characteristics of traction and auxiliary motors and machines for industrial electric locomotives are as follows:
- a. DPE-100 traction motor. Hourly capacity: 70kw. 550v. 150 amp. 470 rpm. Weight: 2,050kg.
  - b. DPE-100A traction motor. Hourly capacity: 100kw. 750v. 150 amp. 520 rpm. Weight: 2,100kg.
  - c. DTI-64 traction motor. Hourly capacity: 55kw. 550v. 112 amp. 845 rpm. Weight: 965kg.
  - d. DPE-220 traction motor. Hourly capacity: 250kw. 750v. Hourly current: 375 amp. 384 rpm. Continuous performance: 295 amp. 412 rpm.
  - e. DK-8A traction motor. Hourly capacity: 216kw. 750v. 290 amp. 565 rpm.

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Continuous performance: 230 amp. 597 rpm.

- f. DK-404B motor for compressors. 13kw. 1,650v.
- g. KD-402V motor for compressors. 13.5kw. 750v.
- h. DK-403V motor for ventilators. 16kw. 1,650v. 1,300rpm.
- i. KB-4/360 motor for cable drums. 3.7kw. 170v. 28 amp. 360 rpm. Weight: 260kg.
- j. DU-3A generator. 3kw. 50v. 60 amp. 1,200 rpm. Weight: 225kg.

#### > Internal Combustion Locomotives (Teplovoz)

57. Dynamo supplies traction motors and part of the equipment for internal combustion locomotives built at the Triple Order Bearing Kharkov Transport Machinery Works No. 75 (KhZTM). Motors and part of the equipment are supplied for TE-1 and TE-2 internal combustion locomotives. TE-1 is an internal combustion locomotive with a 1,000hp, 6-cylinder, 4-stroke, vertical, pressure feed (naduv) Diesel. Weight: 15,380kg. Weight of locomotive: 122t. Six axles. TE-2 has two 1,000hp Diesels of the same type and eight axles. The generating group is supplied by the Kharkov Electric Machinery Works (KhEMZ): maximum power: 1,350 amp; maximum voltage: 870v. Weight of generator and exciter: 4,585 kg. Traction motors supplied by Dynamo are of two types:

- a. DK-304: 98kw continuous capacity. 157v. 752 amp. 270 rpm. Weight: 2,430kg. TE-1 locomotive has six motors. Dynamo also supplies 52 control instruments for this locomotive.
- b. DPT-140: Hourly capacity: 140kw. 440v. 350 amp. 410 rpm. Weight: 2,950 kg.

#### > Mining Electric Locomotives

58. At the present time Dynamo produces only traction motors and electric equipment for mining electric locomotives of various types, built at coal and transport machinery works. From 1943 to 1948 Dynamo was building completely mining electric locomotives of several types. Mining electric locomotives which were produced by Dynamo for haulage of coal in underground workings are as follows:

- a. 2 TR-2 (1938 model, in production till 1946): Trolley mining electric locomotive. Weight on drivers: 7 tons. Two traction motors of series type DK-800A. Transforming plant, mercury rectifiers.
- b. II-TR-2 (in production from 1946): Trolley type. Weight on drivers: 6,500kg. Two DK-801 A traction motors.
- c. II-TR-3: Trolley type. Weight on drivers: 7,000kg. Two DK-801 A motors.
- d. Mine electric locomotive with weight on drivers: 14 tons. Two DK-802 motors. Cam (kulachkovy) controller, rheostat braking.

59. The following traction motors are produced by Dynamo for mining electric locomotives built at other works:

- a. DK-800A: Hourly capacity: 8.5kw. 110v. Hourly current: 100 amp. 300 rpm. Weight of motor: 445kg.
- b. DK-800B: Hourly capacity: 11.4kw. 250v. Hourly current: 55 amp. 470 rpm. Weight without transmission: 445kg.

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- c. DK-801a: Hourly capacity: 20kw. 250v. Hourly current: 95 amp. 600 rpm. Weight without transmissions: 525kg.
  - d. DK-802: Hourly capacity: 46kw.
  - e. MAK-51-6/12: for condenser electric locomotive (for details see below).
60. Dynamo produces motors for electric locomotives of the following types, built at coal machinery works:
- a. DK-800a motors for II-AR-1 battery mining electric locomotives. Weight on drivers: 6,500kg. Two motors per locomotive. Explosion-proof performance (ispolneniye), enclosed, unventilated.
  - b. DK-800B motors for trolley mining electric locomotives of type I TL-1. Weight on drivers: 3,500kg. One motor per locomotive.

Condenser electric Locomotives

61. The design of the condenser electric locomotive was evolved by the Moscow Power Institute imeni Molotov. The Dynamo Works Design Office also took part in designing it. Dynamo engineer B. N. Tikhmenev was awarded a Stalin Prize for this work, as were several persons at the Institute.
62. Condenser mining ac electric locomotives have considerable advantages over dc electric locomotives. They do not require complex transforming plants (mercury rectifiers or motor generators), and the controller wears out much more slowly. Condenser electric locomotives are of two types, with weight on drivers about 7 tons and about 14 tons respectively.
63. The design of the electric locomotive condenser is based on that of the II-TR-2 contact electric locomotive. It has two MAK-51-6/12 motors. These are short-circuited (sic), two-phase, two-speed, with protective (zashchitnoye) device (ispolneniye) and with ventilation; they are fed from an ac network. Two rates of revolution: 500 and 1,000 synchronous rpm. KMR-5b controller. Lighting from special 380/12 transformer of 12v. Fuses to protect the motor from overloading. Braking and stopping are effected by a countercurrent. The locomotive is equipped with oiled paper (Bumazhno-Maslyany) condensers with working voltage of 380v. (Five batteries with capacity of 150 microfarads each)
64. The hourly capacity of motor with 12 pairs of poles switched on is 9.5kw with 422 rpm; with six pairs of poles switched on: 19.5kw and 910 rpm. Working trials at the mines of the Moskvugol Combine over a period of six months showed the desirability of increasing the capacity of the electric motors. From the end of 1950 the Dynamo Works modified the motors, and the hourly capacity of the new motors attains 25kw instead of the former 19.5kw.
65. The motors are placed horizontally, and their axles coincide with the longitudinal axle of the locomotive. After the building and trial of the first model, production of these locomotives was started at the Toretski Works imeni Voroshilov of the Coal Machinery Trust in the town of Druzhkovka (48-35N-27-36E); Ukraine (Donbas). The electric equipment is supplied by the Dynamo Works.

> Main-Line Electric Locomotives

66. Main-line electric locomotives, and their auxiliary machines formerly produced by the Dynamo Works and now produced by the Novochoerkassk Works imeni Budenny, are as follows:

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- a. VL-19: Freight and passenger dc electric locomotive, 3,300v. Weight on drivers: 117 tons, of which 50 tons is weight of electric equipment. Six DPE-340A motors, with trolley suspension. Capacity of motors on shaft with hourly performance: 2,040kw. Tractive effort: 20,000kg. Speed: 37km per hr. Capacity of motors on shaft with continuous performance: 1,800kw. Tractive effort: 16,500kg. Speed: 38.6km per hr. Designed speed: 85km per hr.
- b. VL-22: Freight locomotive. 6-axled. 3,300v. Dc. Weight on drivers: 132 tons, including 53 tons of equipment. Six DPE-340 motors. Hourly performance: 2,040kw, tractive effort: 24,000kg. Speed: 30.6km per hr. Power of current in parallel connection: 750 amp. Continuous performance: 1,800kw. Tractive effort: 20,300kg. Speed: 31.9km per hr. Power of current: 660 amp. Designed speed: 70km per hr.
- c. VL-22M: Freight locomotive, 3,300v. Dc. 6-axled. Two three-axled bogies. Weight on drivers: 132 tons, including 53 tons of equipment, 7 tons ballast, and the rest mechanical part. Overall length (dлина po buferam): 16,480mm. Width of body: 3,100mm. Height to lowered pantograph: 4,900 mm. Diameter of wheel: 1,200mm. Two-sided flexible gear transmission (dvukhsutoronnyaya elastichnaya zubchataya peredacha). Six DPE-400 motors, with trolley suspension. Hourly performance: capacity of shaft: 2,400 kw. Tractive effort: 23,700kg. Speed: 36km per hr. Power of current in parallel connection: 870 amp. Continuous performance: 2,080kw, tractive effort: 19,800kg, speed: 37.5km per hr, 750 amp. Designed speed: 75km per hr.
- d. Main Auxiliary Machines: DK-403 motor-ventilator. DU-3 control generator on VL-19 and VL-22. DK-405 control generator on VL-22M. DK-402 motor compressor (E-500 compressor) on VL-19 and VL-22. DK-404 motor compressor on VL-22M. DK-401 motor generator. All electric equipment.
- e. Characteristics of Traction Motors and Auxiliary Machines:
- DPE-340 traction motor. 340kw. 1,500/3,000v. 250 amp. Continuous power of current: 220 amp. 605 rpm. Weight of motor: 4,220kg.
- DPE-400 traction motor. 400kw. 1,500/3,000v. 290 amp (hourly), 250 amp (continuous). 710 rpm. Weight of motor: 4,220kg.
- DK-403 motor ventilator. Capacity on shaft: 18.5kw. 3,000v. 8 amp. 1,300 rpm. Ventilator of Sirokko type, 280 cu.m. pm with pressure of 140 mm of water column.
- DU-3 control generator. 3kw. 50v.
- DK-405 control generator. 4.5kw.
- DK-402 motor compressor. 13.2kw. 3,000v. 6.1 amp. 915 rpm.
- DK-401 motor generator. Capacity on shaft: 67kw. Voltage of motor: 3,000v. Current of motor: 27 amp. 1,030 rpm. Capacity of generator: 57kw. Current (hourly performance): 600 amp.

#### > Crane and Metallurgical Motors

67. The Dynamo Works produces dc and ac crane and metallurgical motors as follows:
- a. AC Motors: After the war the works produced ac motors of several series:

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KT, KTA, KTS, KTSa, and KTK. In 1948 the works designed the new MT and MTK series and at the beginning of 1949 began large-series production. These new rotors replace all of the above-mentioned old series: KT, KTA, etc., and are produced in sizes 1 to 8. Below are characteristics of some of these motors:

1) MT series with phase rotor, enclosed motors, voltages of 220/380 and 500v:

MT-11-06: Size 1. Capacity on shaft: 2.2kw. at 500v current: 5.4 amp. 890 rpm. Weight: 89kg. Dimensions: length 594mm, width 373mm, height 353mm.

MT-12-6: Size 1. Capacity on shaft: 3.5kw. 8.1 amp. 500v. 900 rpm. Weight: 113kg. Length 647mm, width 373mm, height 353mm.

MT-21-6: Size 2. Capacity on shaft: 5kw. 500v., 10.9 amp. 943 rpm. Weight: 141kg. Length 682mm, width 412mm, height 395mm.

MT-22-6: Size 2. Capacity on shaft: 7.5kw. 500v. 15.8 amp. 946 rpm. Weight 157kg. Length 735mm, width 412mm, height 460mm.

MT-31-6: Size 3. Capacity on shaft: 11kw. 500v. 21.4 amp. 955 rpm. Weight: 205kg. Length 766mm, width 449mm, height 460mm.

MT-31-8: Size 3. Capacity on shaft: 7.5kw. 500v. 16.3 amp. 705 rpm. Weight: 205kg. Length 766mm, width 449mm, height 460mm.

MT-41-8: Size 4. Capacity on shaft: 11kw. 500v. 22.8 amp. 715 rpm. Weight: 298kg. Length 835mm, width 540mm, height 528mm.

MT-42-8: Size 4. Capacity on shaft: 10kw. 500v. 32 amp. 740 rpm. Weight: 363kg. Length 915mm, width 540mm, height 528mm.

MT-51-8: Size 5. Capacity on shaft: 22kw. 500v., 41.5 amp. 726 rpm. Weight: 421 kg. Length 976mm, width 595mm., height 582mm.

MT-52-8: Size 5. Capacity on shaft: 30kw. 500v. 53.5 amp. 726 rpm. Weight: 497kg. Length 1,056mm, width 595mm, height 582mm.

2) MTK series with short-circuited rotor, enclosed motors, voltages of 220/380 and 500v:

MTK-11-6: Size 1. Capacity on shaft: 2.2kw. 4.8 amp at 500v. 885 rpm. Weight: 81kg. Length 470mm, width 373mm, height 353mm.

MTK-12-6: Size 1. Capacity on shaft: 3.5kw. 7.4 amp at 500v. 870 rpm. Weight: 104kg. Length 525mm, width 373mm, height 353mm.

MTK-21-6: Size 2. Capacity on shaft: 5kw. 10.3 amp at 500v. 905 rpm. Weight: 120kg. Length 558mm, width 412mm, height 395mm.

MTK-22-6: Size 2. Capacity on shaft: 7.5kw. 14.4 amp at 500v. (19 amp at 380v, 33 amp at 220v.). 900 rpm. Weight: 151kg. Length 611mm, width 412mm, height 395mm.

MTK-31-6: Size 3. Capacity on shaft: 11kw. 20 amp at 500v. 918 rpm. Weight: 193kg. Length 640mm, width 449mm, height 460mm.

MTK-31-8: Size 3. Capacity on shaft: 7.5kw. 15.2 amp at 500v. 673 rpm. Weight: 193 kg Length 650mm, width 449mm, height 460mm.

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MTK-41-8: Size 4. Capacity on shaft: 11kw. 21.6 amp at 500v. 680 rpm. Weight: 269kg. Length 691mm, width 540mm, height 528mm.

MTK-51-8: Size 5. Capacity on shaft: 22kw. 39 amp at 500v. 692 rpm. Weight: 409kg. Length 819mm, width 595mm, height 582mm.

MTK-52-8: Size 5. Capacity on shaft: 28kw. 48.2 amp at 500v. 696 rpm. Weight: 489 kg. Length 899mm, width 595mm, height 582mm.

- b. DC Motors: Dc crane and metallurgical motors were produced in series KPDN and KPD. In 1948 and 1949 the works design office designed the new MF series of dc motors. From the middle of 1949 the works started large series production of these motors, sizes 1 to 4, capacity from 1.6 to 17kw, voltages of 220v to 440v (1.6kw and 2.5kw; only 220v). From the middle of 1950 the works started production of these motors in sizes 5 to 8 with disconnecting device (razemnoye ispolneniye).

Control Equipment (Apparatura Upravleniya) for electric Hoisting and Transport Machines

68. The Dynamo Works produces numerous types of this equipment. Brief characteristics are given below:

a. Special Crane Controllers:

KP drum controllers and PK cam controllers for ac for the control of series motors in conveying and turning mechanisms (mekhanizm peredvizheniya i povrota).

KPS drum controllers and PKS cam controllers for ac for control of series motors of lifting and lowering mechanisms.

KT drum controllers and TK cam controllers for ac for three-phase asynchronous electric motors in conveying, turning, and lifting mechanisms.

KTK controllers for synchronous control of two motors.

T contactor controllers for conveying mechanism of cranes.

TS contactor controllers for control of drives of lifting mechanisms.

P contactor panels for dc series motors serving conveying mechanisms

PS panels for lifting and lowering mechanisms.

DT, DTS, DP and DPS dual (dvoyny) controllers for control of two crane motors connected by a common shaft.

Contactor-switches of several types for frequent switching on and disconnection of power and auxiliary circuits.

Crane maximum relays (P-4000 and others) for protection of motors from overloads during controller and contactor control. Relay of instantaneous action with self-recovery (samovozvrat).

Reversers (reversing contactor switches) for reversing starting of crane ac motors and remote change-over of stator circuit.

Brake electric magnets of various types for control of mechanical brakes;

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brake magnets for single and three-phase ac; shunt and series magnets for dc.

Terminal or track switches for automatic stopping of mechanisms at terminal sectors of the track (for lifting mechanisms).

KU lever cam terminal switches for auxiliary current.

Spindle switches for restricting movement of mechanisms.

Master controllers (komando-kontroller) for effecting change-over in control circuits of contactor panels.

Press-button plants for control of contactor equipment of telfers, elevators, etc.

Resistance boxes with cast-iron cells (element) for motors with capacity from 3kw. (Consist of cast-iron cells of two types, SB and SM. The numbers of these cells denote their resistance in thousandths of ohm)

b. Lifting electric magnets for cranes:

M-21. Weight: 460kg. For magnet traveling cranes with lifting force of 5 tons.

M-31. Weight: 820kg. For cranes with lifting force of 10 tons.

M-41. Weight: 1,670kg. For cranes with lifting force of 15 tons.

These lifting electric magnets are circular in shape and are intended mainly for lifting and transporting steel scrap and pig iron. In 1948 the works executed an order for the Kuznetsk Metallurgical Combine for rectangular electromagnets for cranes with lifting capacity of 15 tons for lifting and transporting hot rails after rolling. In the last three years the works has executed 12 orders for rectangular electromagnets for various metallurgical works.

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